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Do Rockets and Jets Mean a New Era In Air Travel?

A radio discussion over WGN and the Mutual Broadcasting System

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Do Rockets and Jets Mean a New Era In Air Travel?

MR. MCBURNEY: Our speakers today are Kenneth Jacobs, Supervisor of Propulsion Research with the Armour Research Foundation, Burgess H. Jennings, Professor and Chairman of the Department of Mechanical Engineering in the Technological Institute of Northwestern University, and John T. Rettaliata, Vice President and Dean of Engineering at the Illinois Institute of Technology.

In opening this discussion of jets and rockets, gentlemen, tell us how effective the jet plane has been in the Korean conflict. Will you do that for us, Rettaliata?

Use in Korea

MR. RETTALIATA: Yes, I'd be glad to do that. McBurney, I don't know whether most people appreciate it or not, but the Korean war is the first in which jet planes have seen actual combat duty. We have been hearing a lot about the development of jets over the last decade, but actually, the first time these planes have been used for fighting purposes was just about two months ago, in Korea.

MR. MCBURNEY: Has Korea provided a good test for the jet plane, do you think?

MR. RETTALIATA: No, in my opinion it has been a rather unfortunate battle zone for the baptism of the jet. Actually, despite extremely unfavorable operating conditions, the jet, in my opinion, is giving a good account of itself. In fact, I think it can be reasonably stated that it has prevented a Korean Dunkirk. It is unfortunate, however, that it should be used in this particular country, because in a relatively undeveloped country—we might almost say a primitive country—like Korea, where the pack mule and the coolie are frequently superior to modern military types of equipment, it is difficult to employ the latest military developments to advantage at all times.

The jet plane is a high-speed, shorter-range type of aircraft, which has been handicapped by lack of adequate air fields in the vicinity of the combat zone.

F-80 Jet Fighter

Most people probably don't know, but the jet has rather poor take-off characteristics. In other words, it needs a relatively long runway in most cases, particularly with the Army type of jet planes. The F-80 jet fighter, which is the kind being used in Korea, has a total range approximating about a thousand miles. It has been operated—at least in the early stages of the war—from bases in Japan, which were about 400 miles from the battle line. That meant that the pilot had to travel this 400 miles to get to the scene of the battle.

MR. MCBURNEY: How much time would he have in battle?

MR. RETTALIATA: Well, he only had about ten or fifteen minutes at that time, because he had to remember that he had to get back to Japan, which was another 400 miles, so his fighting time was extremely limited.

In addition to that, weather conditions were poor on many occasions, and this forced the jet to launch its rockets at lower altitudes of about 3,000 feet, instead of a more desirable elevation of about 5,000 feet.

MR. JENNINGS: Of course, another criticism that came in was the fact that because of the high-speed characteristics of the jet, it could not slow down in strafing so that it could take a line of trucks or tanks out and pick them off, one by one. One pass,

very quickly gone over, was all the plane could do before it was out of the range of action again.

MR. MCBURNEY: Why do you say, then, that the jet has been so helpful to us in Korea, Rettaliata?

MR. RETTALIATA: I don't know that I entirely subscribe to this idea of the disadvantages of high speed. I can see no reason why a jet plane couldn't slow down to a couple of hundred miles an hour, if necessary. Admittedly, it has an accelerating problem on its hands after that operation, but the jet was never intended for low-level strafing. However, as far as I know, it has been giving a reasonable account of itself in that kind of an operation.

Ground-Air Communication

The high speed does make it somewhat difficult, but I think a more important factor is the provision of adequate ground-air communications for the direction of the pilot. The ineffectiveness of the communications system in Korea has reduced the capabilities of the F-80 jet plane, through really no fault of the plane itself. I think a striking example of this—that is, the faulty communications aspect—was the error bombing of British troops by American planes, just because the American pilot didn't know or didn't have adequate information as to what was underneath him.

In a fighter plane, high speed is always an asset, and the pilot with the fastest ship has a decided advantage.

MR. MCBURNEY: Have we used these jet planes almost exclusively in Korea?

MR. RETTALIATA: No, we haven't. The Mustang F-51 is a piston engine, propellor type of fighter plane, and that has been operating from bases in Korea, and has done a very good job. I think it should be pointed out, though, that much of its effectiveness is due to the fact that in the early stages of the war, the enemy used practically no air power, and I think one of the reasons the enemy didn't use air power was because we had the jets on the scene of the battle. If we had been using only the piston engine planes, I'm sure you would have seen the Communists using planes much earlier than they did. Now, as we know, they are lately using jet planes, but to my knowledge I haven't heard of any piston engine planes that they are using.

MR. MCBURNEY: How have our jets fared against these Russian jets? Do you have any information on that?

MR. RETTALIATA: Only what I read in the papers, and I guess that is written by American reporters, but it seems that the Americans are always coming out pretty well in these encounters. In most cases they have been outnumbered by the Russian planes, but I haven't heard that a Russian jet has ever shot down an American jet, but I have heard that the Americans have shot down Russian jets.

Development in Russia

MR. MCBURNEY: Do you men have any idea how much development the Russians have done in this field of jet propulsion? Do you know anything about that, Jacobs?

MR. JACOBS: No, I don't have any information first-hand, but the reports coming back from Navy pilots indicate that the MIG-15 or Russian jet is exceptionally fast, and seems to approach or approximate the external configuration of our fastest jet, the F-86. The Navy pilots report that they think the planes can fly over the speed of sound, and also that they have some built-in device to give them exceptionally fast acceleration to use in combat or when they want to get away from a danger zone.

MR. MCBURNEY: You say they resemble our planes?

MR. RETTALIATA: Yes. In fact, I think there is probably a little story behind that. As far as we know, the Russians have something like five different types of jet planes, to the best of my knowledge. Three of those are fighters and two are bombers. They have a four-engine bomber and a twin-engine bomber.

Prior to the appearance of these MIG-15s, I think it had been almost universally thought that the best Russian jet fighter was the YAK, which had reported speeds of up to about 650 miles per hour. The YAK design reflected the influence of several countries. In outward appearance it was very similar to our American Republic F-84, and there is no question but that the many German jet engineers who were captured by the Russians have also, undoubtedly, contributed to the Russian jet program.

Ironically, in certain respects the chances are that possibly some of the YAKS that are now appearing—or the MIGS that are now appearing—in Korea may have jet engines which were sold to the Russians by the British. The British sold these engines to the Russians a couple of years ago, and they were very highly advanced types. It certainly has helped the Russian jet development appreciably to get these engines.

'U.S. Engines in Russia'

MR. MCBURNEY: We have been hearing a lot about the Russians using British made equipment and American made equipment. Do you men have any feeling on that subject?

MR. RETTALIATA: I certainly do. I think it is an unfortunate situation to help the enemy by giving him your latest developments. In fact, some of our Navy planes use this same engine which the Russians have in their possession, and it is entirely conceivable that if we have some carrier planes operating over there, they may be fighting against an enemy plane with the same engines in them.

MR. MCBURNEY: You men are engineers and not politicians, but I would like to ask if there is any way to stop this sort of thing?

MR. JENNINGS: I think it has been stopped at the present time, but we can think of examples other than airplane engines, where we have given away useful information to our potential enemies.

MR. MCBURNEY: Well, let's get back to our subject, Jennings.

I take it from what you men have said that speed is the principal advantage of jet propulsion in aircraft.

MR. JENNINGS: There is no question but that the plane with the highest speed is at a decided advantage in any fighter activity, and the jet plane, with high speed, ease of maneuverability and relative safety and comfort, is rather an ideal type of unit.

MR. MCBURNEY: How fast can they go?

700 Miles Per Hour

MR. JENNINGS: Jet planes can approach 700 miles per hour, and with the help of rockets it is thought that they can even exceed that. In fact, although there are no official records of it, it is well known that speeds in excess of 700 miles per hour have been reached.

The ordinary propellor plane, with the reciprocating engine, such as we are familiar with, has speeds in the range of, let's say, 200 to perhaps 425 miles per hour. The jet would perhaps go from, say, 400 to 650 miles per hour in its conventional range.

In this country we have thought of the jet largely as being developed for military purposes, but the British have gone one step ahead of us, and have been interested in the development of jet planes for commercial operations. To date, the most outstanding development along this line has been the "Comet," which was built by the DeHaviland Company in Great Britain. This is a typical commercial airliner, and has had a large number of successful trial runs in England and over the Continent to Egypt, and even to South Africa.

MR. RETTALIATA: Jennings has brought up two points on which I would like to say just a few words. First, the principal advantage of the jet plane is high speed. Now, as we mentioned a little while ago, some people said this has been a disadvantage in Korea, but I have actually never heard of any pilot who would swap a high-

speed fighter plane for a slower speed plane, regardless of what type of operation he was on.

Getting back to commercial transports, in my opinion the American transport plane will soon lose the world-wide supremacy which it has possessed almost exclusively for so many years. Actually, at the present time, at least 85 per cent of the planes being used throughout the whole world by commercial air lines have been built by American companies. Most of these planes have been the DC-6 or the Constellation, for the trans-Atlantic flights.

MR. JENNINGS: Rettaliata, aren't you going just a little bit far there? Aren't some of these jet bombers which we have developed in the position where, without too much difficulty, they could be adapted over into commercial transport type planes?

British Advancement

MR. RETTALIATA: That is entirely correct. It can be done, but it takes somebody to make the decision to do it. The British, with their new type gas turbine and jet airliners, are certainly winning with their bid for universal air leadership.

Many of our latest medium range, piston-engined commercial aircraft are already obsolete. I won't criticize these planes by name, because someone's father may write me a nasty letter, but in the civil aircraft field America is repeating the same mistake made in World War II in military aircraft, when we permitted the British to conduct the development work on jet engines while our facilities and engineering talents were used for the mass production of conventional piston engines. As a result, we lagged behind the British in the jet engine field, and spent several years in approaching their accomplishments. Even today, reports are that we don't have jet engines with power ratings as high as the British. The British claim that a particular jet, their Sapphire, has the highest thrust of any jet engine in existence.

MR. MCBURNEY: Are you men saying in substance that these jet planes are likely to replace the old piston-type engines? Do you think that is the case?

MR. RETTALIATA: I don't think there is any question about it for higher speed types of flight. There are some slower speed applications—say, in the personal airplane and types of that kind—where we will continue to use piston engines for some time to come.

64-Passenger Jet

MR. JACOBS: It is interesting to note that the Lockheed company had designed a 64-passenger jet airliner which was recently shelved because of other commitments on military aircraft.

To give an idea of the advantages to be gained by this type of plane, computations show that the travel time for this airplane from Los Angeles to Chicago would be three hours and twenty minutes.

MR. MCBURNEY: That's a straight jet plane?

MR. JACOBS: That's a straight jet plane, and it would carry 64 passengers at a cruising speed of a little over 600 miles per hour.

MR. JENNINGS: And yet when you start talking about figures of that nature, and say that you can get to New York in an hour and a quarter, and have to spend three hours total time getting back and forth to and from the airports, the position becomes somewhat ludicrous.

MR. MCBURNEY: You were mentioning the Comet plane that the British have developed. That is designed primarily for commercial use?

MR. RETTALIATA: It is entirely for commercial use. I guess we could say the DeHaviland Comet is the most notable example of British efforts in the field of turbo-jet transports. The Comet is a 4-engine, 36-passenger plane, with a cruising speed of about 500 miles per hour, and a present range of about 2,000 miles at an altitude of 40,000 feet. After further modifications to improve its range, it is intended to fly from London to

New York in about six hours. This is approximately half the time which is now required for conventional transports.

The flight tests on the Comet have revealed it to exceed its cruising speed and altitude specifications. Actually, about 14 of these ships are now on order for the British Overseas Airways Corporation, and 2 for the Ministry of Supply.

Fuel Consumption

MR. JENNINGS: Even here it is of interest to note that these DeHaviland engines—which develop about 5,000 or more horsepower each—were originally developed for the British Vampire fighters.

One question that comes up in connection with these planes is the problem of fuel consumption. There is no question that a jet plane has a higher fuel consumption than is required for the reciprocating engines, but this figure is being improved. Roughly, 1¼ pounds of fuel per hour per pound of thrust used to be the figure; that figure has now reached 1 pound, and is on the way to a figure of, let's say, seven-tenths pounds of fuel per hour per pound of thrust. However, inasmuch as the engine itself weighs in the neighborhood of one-third to one-quarter as much as a reciprocating engine of the same horsepower, the extra fuel picture is somewhat offset.

MR. MCBURNEY: You make a distinction between a reciprocating engine and a gas turbine engine. The gas turbine engine is the jet engine. Right?

MR. JENNINGS: That's right.

MR. MCBURNEY: And the reciprocating engine is the type that I have in my automobile?

MR. JENNINGS: Yes—very similar to what you have seen on the old planes and in the automobiles.

MR. RETTALIATA: Jennings, you brought out a point about fuel consumption. I think we must admit that the fuel consumption of the jet engine is higher than that of the conventional engine, but the much greater speed capabilities of the jet actually result in lower total operating cost per mile. I am assuming a commercial venture now. This comes about from the fact that the fuel cost is really only a part of the picture; there are other costs which are common to all types of airplanes, such as the salaries of the crew, the depreciation, the insurance, the maintenance and so forth, which really have a greater influence on total costs, and these latter types of costs in dollars per hour don't vary greatly between a jet or a piston engine plane, with the result that the faster jet plane actually shows some lower cost on a per-mile basis.

MR. MCBURNEY: Now I think many of our listeners will have one question in mind that is suggested by the high speeds which these jet planes apparently can achieve. We have heard a lot about the sonic barrier, and traveling faster than the speed of sound. What is this sonic barrier? Do you get into trouble when you pass the sonic barrier, or attempt to, Jennings?

Sonic Barrier

MR. JENNINGS: The sonic barrier used to be quite a bugaboo; it is not, really, any more. The fact is that the sonic speed is really the speed of sound, and the power required to drive a plane increases greatly until you reach that limit. After you get into the sonic speed range, the power required is not so great.

MR. MCBURNEY: What is that limit, approximately?

MR. JENNINGS: At sea level the speed of sound, or the sonic speed, is about 760 miles per hour. As you go up to higher altitudes and lower temperatures, it decreases. For example, the value is 680 miles per hour at 30,000 feet.

We are talking about speeds with these jet planes which are very closely in that neighborhood, and as we mentioned before, it is well known that some planes have pierced the barrier.

MR. MCBURNEY: What happens to the pilot? Anything in particular, when you pass this sonic barrier?

MR. JENNINGS: There is no effect on the pilot at all, except that as the plane maneuvers at these very high speeds, and makes turns, the centrifugal forces which affect the pilot can be somewhat objectionable and annoying.

MR. MCBURNEY: What planes, Jacobs, have passed this sonic barrier?

MR. JACOBS: Well, no plane has officially passed it except the X-1, which is a rocket plane. The present world speed record is held, I believe, by the F-86, at about 670 miles an hour. That is the official speed record.

MR. MCBURNEY: You are our expert on rockets here today, Jacobs. Thus far we have been talking about jet propulsion. Is a rocket primarily a weapon or a type of propulsion? Tell us a little about it.

MR. JACOBS: The rocket is primarily a means of propulsion. Up until the present time it has been used primarily to give propulsion to weapons or to missiles, such as rockets fired from air to ground, and so on.

The X-1 is a wonderful research tool, and it has given us a lot of information on this flight through the so-called sonic barrier. Information has been released that it has many times flown over the speed of sound.

Speed of Rockets

MR. RETTALIATA: Actually, Jacobs, you probably know that while it is not official, it has been reported that this plane has achieved speeds approaching 1800 miles per hour, which, to my knowledge, at least, is the fastest any plane with a pilot has ever gone. We know that the V-2 rocket, during the last war—the German V-2—attained speeds of around 3600 miles per hour, but that did not include a pilot. The X-1, at least as far as I know, is the fastest plane to fly with a pilot.

MR. JENNINGS: Jacobs, it is my impression that the greatest objection to the rocket is the fact that its range is limited, that it uses up its energy supply and that is the end of it. Is that true?

MR. JACOBS: The rocket is a very thirsty engine. It uses up fuel at a very, very great rate. For instance, the V-2 mentioned had a total weight at take-off of 24,000 pounds, of which some 18,000 pounds was propellant. The rocket not only uses fuel at a great rate but, in general, uses a much more expensive fuel than the jet engine, such as alcohol, liquid oxygen, and so forth, where the jet engine can use kerosene.

MR. MCBURNEY: I'm going to ask some naive questions here.

You don't travel in a rocket; you travel in a ship that is propelled by a rocket. Is that correct?

MR. JACOBS: That's right. The rocket is a means of propulsion, just the same as the turbine engine and the piston engine.

MR. MCBURNEY: It's an engine?

MR. JACOBS: Yes, it is an engine.

MR. MCBURNEY: What about all this wild talk of traveling to another planet in a rocket? Is that possible?

MR. JACOBS: It is theoretically possible, but it requires a tremendously strong engine. With our present liquid or solid fuels, it would require enormous quantities of fuel, but with the advent of atomic energy, it is entirely possible that in some years an atomic engine will be available to permit us to get out of the earth's atmosphere and gravitation field.

The rocket is the only engine that permits space travel.

Space Travel

MR. JENNINGS: Where there is no atmosphere.

MR. JACOBS: Where there is no atmosphere, because it carries with it its own oxygen and fuel.

MR. MCBURNEY: Have we had any such space travel in rocket ships?

MR. JACOBS: Have we had any?

MR. MCBURNEY: Yes.

MR. JACOBS: No, there has been none. The V-2 and similar rockets have at-

tained extreme altitudes of over a hundred miles, which is much higher than any other engine can take a vehicle.

MR. RETTALIATA: I think the rocket does open up an entirely new avenue for at least expectations or hopes of achievement as far as flight is concerned.

You may recall several years ago when the Signal Corps bounced radar off the moon. Well, we are told they were considering the feasibility of interplanetary flight.

A study has been made of the possibilities of a ship flying at an altitude of 200 miles. If that plane could have a speed of five miles per second (now, that is a very fast speed, but the V-2 went one mile per second, so we can't say it's impossible), then at that altitude and that speed, the centrifugal force of the plane would exactly balance the pull of gravity, so if we could achieve those conditions, that ship could go around the earth just the same as a satellite, and it is interesting to observe that at that speed there is no point on the earth more than 45 minutes away from the most remote point, so assuming the enemy has such a missile, we would have less than an hour to prepare our defense.

MR. JENNINGS: The whole question of the energy to drive both these rockets and jet planes isn't fully realized. Perhaps I might bring it to your attention by mentioning that in a thousand hours of operation, a jet engine consumes as much kerosene or gasoline as the original cost of the engine itself. That is in just one thousand hours.

'Relatively Economical'

MR. MCBURNEY: Are you making the point that these jets are not economical to operate? Are you making the point that they are excessively costly to operate, Jennings?

MR. JENNINGS: I'm making the point that they use enormous amounts of fuel. In terms of the distance they have gone in the thousand hours I mentioned, they are relatively economical.

MR. JACOBS: I'd like to mention one other broad application of the rocket engine, and that is for jet-assistance take-off. For many years the Navy has used the JATO units to reduce the take-off length of time for flying boats. Numerous studies have been made of using JATO with a DC-3.

MR. MCBURNEY: "JATO"—what is that?

MR. JACOBS: "JATO" means "jet-assisted take-off." Using JATO units —rocket engines attached to the underside of a DC-3—they can reduce the take-off distances considerably, which is of particular importance right now for cargo planes, especially in taking off from airports at high altitudes.

MR. MCBURNEY: Earlier in our discussion Rettaliata made the point that Great Britain has made substantial development in the fields that we are discussing. I take it we are lagging behind. How do you explain that? Why has Britain gone so far ahead of us?

MR. RETTALIATA: I think it's a matter of foresight, as far as I can see.

I might mention that several years ago I flew in a jet plane, and once you fly in one of those things, you don't want to fly in any other kind, because of the absence of vibration, the low noise level, which makes it so much more attractive than flying in a piston type plane. I think the customer in the future is going to demand that kind of flight, once he has experienced it, and I think the British are just getting there ahead of us.

Government Assistance

Actually, it is a tremendous undertaking, and I don't think it is entirely out of order to suggest that our government finance the original development of commercial jet transports.

MR. JACOBS: I'd like to mention that not only the British are pioneering and getting quite a way ahead of us in the jet transport field, but the

first jet transport built in the Western Hemisphere was recently completed in Canada.

MR. JENNINGS: There is a reason, to a certain extent, to account for that. Much of the British research is integrated under the socialistic type of government they have, whereas in this country, with free enterprise, our companies do a large amount of work independently. Perhaps we should develop a closer means of integration between research and industry.

MR. MCBURNEY: Would you men recommend government support? I take it you do, Rettaliata, for some of these developments.

MR. RATTALIATA: In these research developments, I would.

MR. MCBURNEY: In conclusion, it certainly is clear that you men are enormously enthusiastic about the jet plane and its potentialities for development. Your recommendation, I understand, is a more extensive program of research, development, and production in the United States.

Suggested Readings

Compiled by Eugen Eisenlohr and M. Helen Perkins, Reference Department, Deering Library, Northwestern University.

Aviation Week 52:13-15, Jan. 9, '50. "Lockheed's Proposals for Jet Transports." R. H. WOOD and R. HOTZ.

Problems faced by Lockheed and other manufacturers such as: financing turbojet transports, heavier construction of planes, fuel location, training of operators, and stacking at landing time.

Aviation Week 52:23+, Apr. 24, '50. "Power Study for Long-Range Transports." A. KARTVELI.

A consideration of high-speed travel in relation to three propulsion schemes: the reciprocating engine compounded with turbosupercharger, the turboprop, and the pure jet.

Aviation Week 52:17-18, May 1, '50. "SAE Tusstles With Jet Problems."

The National Aeronautic Meeting of the Society of Engineers discusses gas turbine propulsion as it relates to transportation factors.

Aviation Week 52:41-2, May 8, '50. "Future's Planes vs. Today's Fields."

Changes needed in today's airports to care for the new jet transport planes.

Aviation Week 52:27-8+, Je. 12, '50. "Engineers Advance Turbine Aircraft Data." I. STONE.

Interesting article taking in runway factors needed for jet take-offs and landings, data on crew requirements, fuel consumption, wheel prerotation, pressurization, and many other problems.

Coronet 29:125-8, Nov., '50. "How Fast Will We Fly?" V. BOESEN.

A discussion of the speed of various types of jet planes and an estimate of what rocket planes may be able to do.

Flying 44:29+, Jan., '49. "Daring Young Genius of Jet Propulsion." J. P. McEVOY.

The story of Sir Frank Whettle, the father of jet aircraft, and the minute by minute advances in jet engineering made in early 1949.

Flying 47:32-3+, Jl., '50. "That First Jet Ride Is Lonely." C. L. BLACK.

Shows the meticulous training needed by jet pilots.

Harper 200:80-6, Mar., '50. "British Jet Transports." A. DOUGLAS.

Interesting comparison of the British jet with other types of British and American planes, and a discussion of problems entailed in jet traffic control.

Harper 200:80-6, Mar., '50. "British Jet Transports." A DOUGLAS.

National Geographic Magazine 98:281-322, Sept., '50. "Flying in the Blowtorch Era." F. G. VOSBURGH.

Colored photographs and factual text, approved by official sources, on jet and other modern planes and the techniques of their pilots and crews.

Newsweek 34:59, Dec. 12, '49. "Distance Sprinter."

The new XT-40 turbo-prop plane of the Allison Division of General Motors in comparison with British jets; also something of the 3,000 mile transcontinental cargo rocket outlined on paper by Dr. Tsien of Cal Tech.

Newsweek 35:61, May 1, '50. "Jet-Liner Jolt from Canada."

Types of turbo-prop planes that are being built by American manufacturers during the interval in which they are attempting to catch up with British and Canadian jets.

Popular Mechanics 92:73-6, Jl., '49. "Blueprint for a Passenger Rocket." T. E. STIMSON.

According to Stanley Hiller, Jr., West Coast helicopter manufacturer, a winged rocket carrying a crew of two has passed its preliminary tests in model form and can be built at any time. Pictures with accompanying description are given.

Popular Mechanics 93:149-52+, Apr., '50. "Commute by Jet." A. O. COOKMAN.

The author suggests that a two-year period of working on jet transport problems will elapse before tests prove that passengers won't be "cooked," "quick frozen," or "starved for oxygen" by a cabin puncture at 40,000 feet.

Popular Science 156:126-7, Feb., '50. "One Hour, Broadway to Hollywood."

Two pages of sketches adapted from the drawings of Dr. Tsien, Cal Tech expert, showing his idea of a rocket airship.

Science Digest 28:19-23, Oct., '50. "Jet-Plane Family." W. A. COLEAL.

The history of jet planes including descriptions of the turbojet, ramjet, turboprop and rocket, and a look into the future as to problems and possibilities.

Science News Letter 56:393, Dec. 17, '49. "New York-Los Angeles in One Hour by Rocket."

A passenger rocket-liner with a speed of 9,140 miles per hour is within the possibility of today's technology according to Dr. Tsien of Caltech.

Time 54:26, Aug. 22, '49. "Test Flight; First Commercial Jet Transport to Fly in North America."

Planned to meet Canada's need for an economical inter-city air service, the jetliner of the A. V. Roe Company of Toronto carries 50 passengers and flies at 430 miles an hour.

United Nations World 4:45-52+, Mar., '50. "Life in the Air Age, a Special Aviation Survey."

Contents: The anatomy of global industry no. 1, or the story behind 70 airlines under 43 flags; The future of air cargo; The UN watches the wings, or the work of the International Civil Aviation Organization; 20 questions of the air age and their answers.

United States News 28:13-15, Apr. 7, '50. "Flying Saucers, the Real Story."

Probably a combination of a helicopter and fast jet plane. Since official inquiry was called off, it appears that Air Force officials know where the saucers originate.

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